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Digenea, Heterophyidae, *Centrocestus formosanus* (Nishigori, 1924) metacercariae: Distribution extension for Mexico, new state record, and geographic distribution map

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Centrocestus formosanus (Nishigori, 1924) is a minute trematode species inhabiting the intestine of fish-eating birds and mammals (Scholz and Salgado-Maldonado 2000). This trematode was apparently introduced to Mexico as larval stage (sporocyst or redia) within its first intermediate host, i.e., the thiarid snail *Thiara tuberculata* (Müller, 1774) (Amaya-Huerta and Almeyda-Artigas 1994). The second intermediate host includes various species of freshwater fish; to date, metacercariae of *C. formosanus* has been recorded parasitizing 59 freshwater fish species, both native and introduced, in 12 states of central and southeastern Mexico (Pérez-Ponce de León et al. 2007). However, the occurrence of this trematode species in fishes of northern Mexico has not been documented even though the snail *T. tuberculata* has been reported in hydrological systems of Chihuahua and Coahuila (Contreras-Arquieta 1998).

Figure 1. *Cyprinella lutrensis*, adult male from Río Salado de Nadadores, Coahuila, Mexico.

During a prospective study addressed to establish the parasitological fauna of freshwater fishes occurring in arid regions of Mexico, particularly associated with the Río Bravo basin, the metacercarie of *Centrocestus formosanus* parasitizing the gills of the native fish *Cyprinella lutrensis* (Baird & Girard, 1853) (Cyprinidae; Figure 1) was found.

Fishes (15 males and 15 females, total length 45 to 74 mm, collected under the *Cartilla Nacional de Colector Científico de Flora y Fauna Silvestre* FAUT-0057 issued to G.P.P.L.), were captured on May 3rd 2008 in Río Salado de Nadadores at San José del Águila, Coahuila (27° 02' 38.2" N, 101° 39' 51.4" W) using seine nets (Figure 2). Metacercariae (a total of 5485 cysts, prevalence = 100%, mean intensity = 182.2 cysts per infected host) were observed *in vivo*; some were isolated from cysts using preparation needles, fixed with 4% formalin and stained with Mayer's Paracarmin (Figure 3). Morphology of metacercariae fully corresponds with those described by Scholz and Salgado-Maldonado (2000) for central and southeastern Mexico. Voucher specimens were deposited in the Colección Nacional de Helmintos (CNHE), *Instituto de Biología, Universidad Nacional Autónoma de México*, Mexico City, with the accession #6253. Additionally, some shells of *Thiara tuberculata* (deposited at the *Colección Nacional de Moluscos, Instituto de Biología, Universidad Nacional Autónoma de México*, accession # CNMO 2763) were collected from the bottom of the river, but not alive specimens were found during our sampling and we could not examine the first intermediate host for larval

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stages of *C. formosanus*. Even though, the presence of the snail in the locality is important to correlate the presence of the trematode species and it explains its high infection levels.

Northern Mexico is predominantly an arid region, with important hydrological systems inhabited by numerous native freshwater fish species, including an endemic component (Miller et al. 2005). However, a comparison with central and southeastern Mexico show a few number of studies conducted on the helminth fauna of freshwater fishes. These few studies do not report the presence of metacercariae of *Centrocestus formosanus*, although its occurrence should be correlated with previous records of the gastropod intermediate host in the region, and the high capacity of the digenean to disperse and infect a large number of second intermediate host species. Our findings represent the first record of the metacercariae of *C. formosanus* in freshwater fish of northern Mexico, where this invasive parasite could represent a potential risk factor to the survival of native fish fauna because its high prevalence and pathological effects over the host (Vélez-Hernández et al. 1998; Alcaraz et al. 1999; Ortega et al. 2005).

The snail *Thiara tuberculata* serves as the first intermediate host of *Centrocestus formosanus* in Mexico (Scholz and Salgado-Maldonado 2000). This snail species has been purposely introduced into some localities to control other snail populations that act as vectors for human schistosomiasis, a control mechanism that has been used for other snails (Pointier et al. 1991; Scholz and Salgado-Maldonado 2000). Instead, it was apparently introduced to Mexico as a food source for the black carp *Mylopharyngodon piceus* (Richardson, 1846), a species that was imported from China with aquaculture purposes (Amaya-Huerta and Almeyda-Artigas 1994).

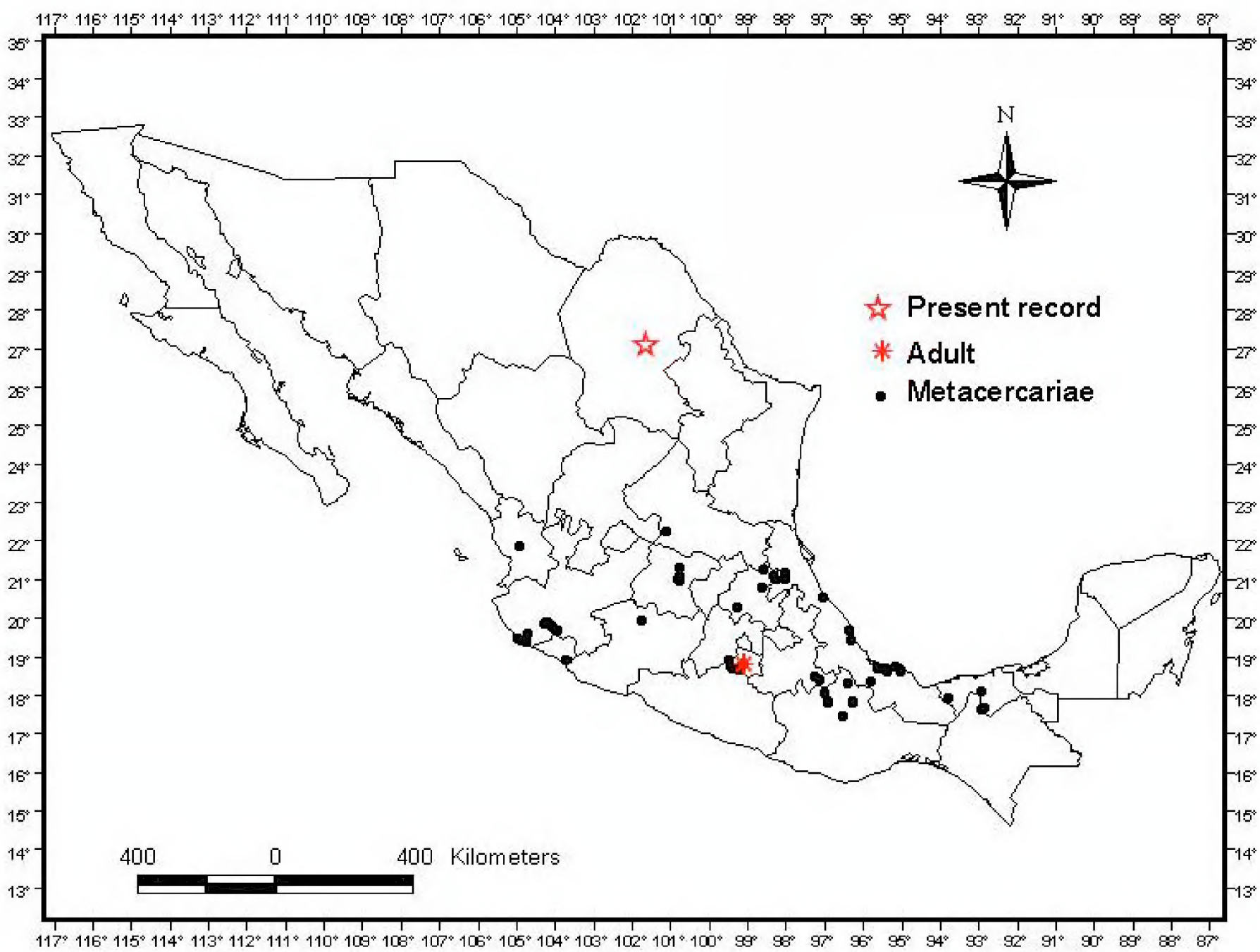

Figure 2. Map of Mexico showing the geographic distribution of *Centrocestus formosanus* (based on Pérez-Ponce de León et al. 2007).

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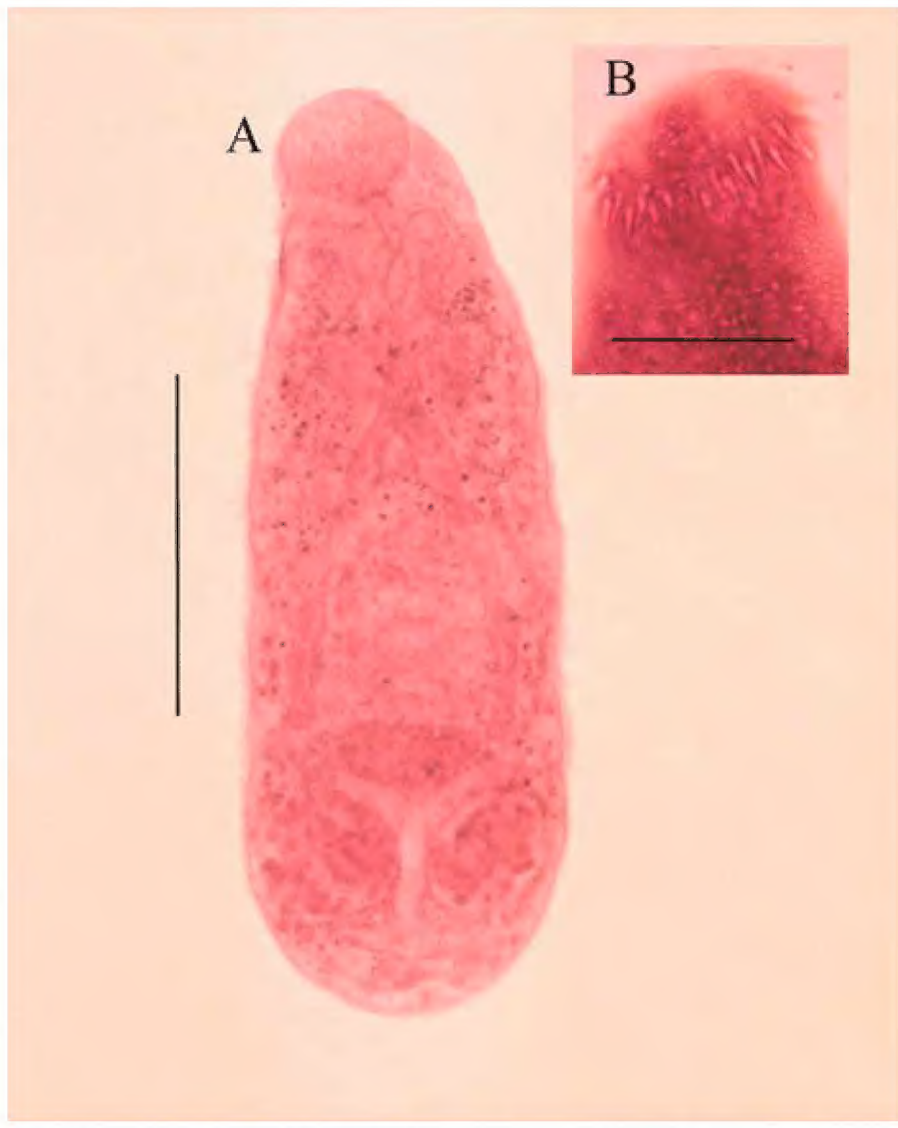

Figure 3. Metacercariae of *Centrocestus formosanus*. A, Ventral view, scale bar 100 μm; B, Detail of the anterior end showing the rows of spines, scale bar 25 μm.

The high dispersal capability of *C. formosanus* and its occurrence in a wide range of freshwater fish species throughout Mexico represents a potential problem not only for aquaculture, but also for establishing proper conservation practices in wild native fish. Knowledge about distributional range of the metacercariae of this trematode species, along with further research in other stages of its life cycle, will contribute with relevant data that, added to information derived from the host biology and the deterioration of the ecosystems they live in, will allow conservationists to propose proper management strategies to preserve biological resources in the area.

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Literature cited

Alcaraz, G., G. Pérez-Ponce de León, L. García-Prieto, V. León-Règagnon and C. Vanegas. 1999. Respiratory responses of grass carp *Ctenopharyngodon idella* (Cyprinidae) to parasitic infection by *Centrocestus formosanus* (Digenea). Southwestern Naturalist 44: 222-226.

Amaya-Huerta, D. and J. Almeyda-Artigas. 1994. Confirmation of *Centrocestus formosanus* (Nishigori, 1924) Price, 1932 (Trematoda: Heterophyidae) in Mexico. Research and Reviews in Parasitology 54: 99-103.

Contreras-Arquieta, A. 1998. New records of the snail *Melanoides tuberculata* (Müller, 1774) (Gastropoda: Thiaridae) in the Cuatro Cienegas basin, and its distribution in the state of Coahuila, Mexico. Southwestern Naturalist 43: 283-286.

Miller, R. R., W. L. Minckley and S. M. Norris. 2005. Freshwater fishes of Mexico. Chicago. University of Chicago Press. 652 p.

Ortega, C., L. F. Vega, R. Fajardo and R. Enríquez. 2005. Descripción de un caso clínico-patológico de *Centrocestus formosanus* en peces de ornato. Resúmenes del Segundo Foro Internacional de Acuacultura del Instituto Nacional de la Pesca, México. Accessible at http://www.inp.sagarpa.gob.mx/publicaciones/Publicaciones_Especiales/Foros/PDF/cartel006.pdf. Captured on May 2008.

Pérez-Ponce de León G., L. García-Prieto and B. Mendoza-Garfias. 2007. Trematode parasites (Platyhelminthes) of wildlife vertebrates in Mexico. Zootaxa 1543: 1-247.

Pointier, J. P., M. Frederic and V. Mazille. 1991. Biological control of *Biomphalaria glabrata* by *Melanoides tuberculata* on Désirade Island, French West Indies. Journal of Medical and Applied Malacology 3: 49-52.

Scholz, T. and G. Salgado-Maldonado. 2000. The introduction and dispersal of *Centrocestus formosanus* (Nishigori, 1924) (Digenea: Heterophyidae) in Mexico: A review. American Midland Naturalist 143: 185-200.

Vélez-Hernández, E. M., F. Constantino-Casas, L. J. García-Márquez and D. Osorio-Sarabia. 1998. Gill lesions in common carp, *Cyprinus carpio* L., in Mexico due to the metacercariae of *Centrocestus formosanus*. Journal of Fish Diseases 21: 229-232.

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